High-Resolution Geostationary Visual Reconnaissance Automated Object Tracking for Geolocation in GPS-Denied Environments and Soliton-Sweeping for Transient EM Quiet in High-Noise Environments

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Introduction

Although sufficiently advanced inertial navigation is likely the future of precision navigation in GPS-denied environments, extant visual reconnaissance systems may be creatively leveraged with no need to develop novel technologies in order to provide real-time PNT services.

Abstract

Provided robust alternative data links, real-time PNT may be provided through the real-time object tracking from visual reconnaissance platforms in HEO. Improvements to the effective resolution of HEO platforms, largely owed to methods such as meta-image generation using angular-offset platform clusters and algorithmic atmospheric turbulence elimination along with noise reduction and sensitivity improvements make 4-inch GRD from HEO possible.

With this ability coupled with modern, automated image processing and object tracking, hundreds if not thousands of objects may be tracked visually including friendly forces. In the event that GPS is jammed, visual reconnaissance platforms in HEO may relay the current position of ships, ground units and even missiles in flight to the missiles themselves in real-time through alternative data links. These alternative data links could be constituted from helical LASER (resistant to atmospheric scattering) to collimated microwave (more difficult to intercept making the calibration of jammers more difficult) to downlinks from satellite internet services to short-wave radio broadcasts. Helical light in the IR band would be the most practical option for relaying this sort of information when considering the need for large amounts of bandwidth and given that the position of the units are known to the reconnaissance satellite, which could provide the needed information to relay satellites needing to know the geospatial address of units requiring guidance in order to address optical communications conveying the timing data.

Induced Quiet Through Tactical EM-EM Adsorption

Such a strategy could be further enhanced by ensuring limited GPS functionality, even in denied environments. This approach may be termed *soliton-sweeping*. As GPS jamming tends to come from ground-based sources (lateral,) ground units equipped with pulsed anti-jammers operating upon a principle of directing soliton waves in the direction of the jamming source in bursts can provide periods of radio quiet (at least with respect to a given jamming source) sufficient

to enable a location request and return transmission from the GPS constellation to be executed successfully. In some cases, it may be necessary to identify multiple-ground based jammers and to direct synchronized waves in all necessary directions as well as toward a point which is halfway between the jamming sources and the satellites themselves, as jamming is most frequently directed at both satellites and ground-units. This approach is viable as soliton waves have the established effect of "mopping up" EM in flight and carrying it away in the overall direction of momentum of the wave. In this use case, soliton waves may be used to *adsorb* electromagnetism in a revolutionary anti-jamming approach.

Conclusion

Regardless of how positional data is related to the unit or missile to be guided, the ability to initialize tracking of objects with established GPS coordinates visually and without interruption affords a viable alternative not requiring constant access to GPS timing data.

Particularly when coupled with soliton-sweeping, intermittent GPS availability (with windows of functionality of perhaps fractions of a second, may suffice to enable combat effectiveness for ships, ground units and guided munitions, alike, regardless of the employment of jammers by an adversary.